

**Now
Offering
IPA-free
Texturing**

Advanced Processing for High Efficiency Solar Cells with Very Low Cost of Ownership

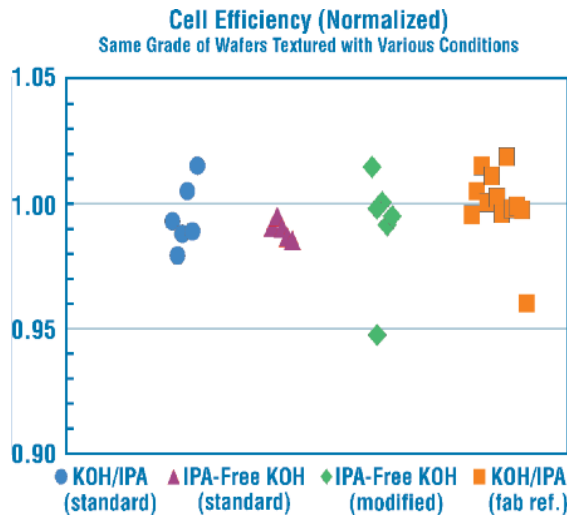
Pre-clean Step and Closed Loop Process Control Provides Uniform Texturing

- Pre-clean step (multiple options, including chemical-free processing) ensures consistent wafer-to-wafer performance
- Patented ICE technology monitors and controls all critical process parameters
- System ensures controlled and consistent texturization for each lot
- Process provides the right balance of pyramid size and minimized reflectance
- Modify textured surface to improve PECVD layer application
- IPA-free process shortens process time while reducing operational costs and hazard potential
- Controlled process enhances yield to lower cost of ownership

Advanced Removal of Metal Contamination

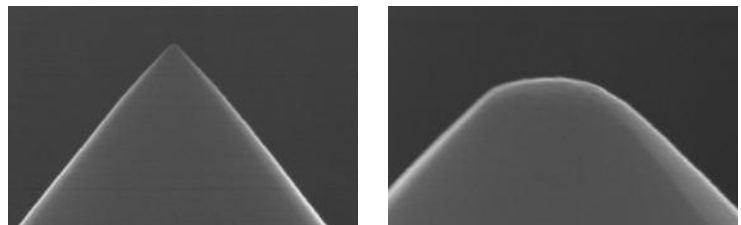
- Proprietary metals clean step uses commercially available chemistries
- High purity drying for hydrophobic wafers
- **The result: extremely low metals levels for maximized Voc –implied Voc over 740 mV**

Controlled Texturing Produces Uniform Pyramids Sized to Your Choosing



Optional IPA-free process provides efficiency comparable to "standard" IPA processing

Pyramid Smoothing (right) Improves PECVD Layer Application



Lower Metal Levels and Better Surface Passivation Yield Higher Cell Efficiency: Achieved Implied Voc over 740 mV

	Al	Ca	Cr	Cu	Fe	Mg	Ni	K	Na	Ti	Zn
Customer POR	37	50	1.7	63	10	22	0.24	6.4	17	0.84	1.5
Akron Solar BKM	BDL	2.8	0.08	0.17	0.25	1.1	BDL	2.5	0.74	0.24	0.53

Metals on bare silicon wafers; 1E10 atoms/cm² by VPD;
Note: BDL (Below Detection Limit)

GAMA-Solar for Advanced Cell Production



Production Ready GAMA-Solar Features and Benefits

- Robust hardware and multiple robots produce high throughput 200-wafer lots (up to 3,000 wafers per hour)
- Reliability > 1000 hours MTBF (per SEMI E10-96)
- Integrated chemical blending, bleed & feed capabilities and chemical monitoring with closed-loop control systems
- Recirculating rinse tanks
- Windows® operating system and complete SECS/GEM integration for interfacing with factory monitoring system and built in data analysis capabilities
- Includes start-up by NAURA Akcion process engineer
- Multiple drying options
- GAMA-Solar is ideally suited to support pilot production lines
- One single tool can be easily configured to address multiple process steps
- Flexible software allows for multiple recipes, multiple uses of process tanks, and process times that vary by recipe
- Can vary recipes based on wafer manufacturer
- Integrated chemical blending, dosing and bleed and feed capabilities for extending bath life

State-of-the-art Applications Laboratory To Fine Tune Your Process

- PhD scientists with years of wet process experience
- Recipes include processes for: alkaline and acidic texturization for running any size solar wafer; all chemistries are available
- Advanced metrology capabilities for analyzing wafer characteristics including:

Spectrometer - measures reflectivity

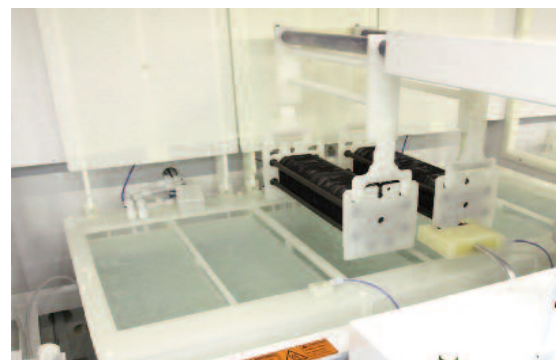
Ellipsometer - measures thin film

Optical Microscope - for defect and surface topography analysis

Scanning Electron Microscope- for defect & surface topography analysis



Robust Hardware and Multiple Robots for High Throughput



Low cost chemical solutions:

Dilute ratios

No designer chemistries

Chemical-free processing option for certain steps



Lab demonstrations to support your process development